CLAIMS

1.   A communicating apparatus which makes spreading by multiplying transmission data by a chaos spreading code and transmits a spreading output, comprising:

first and second spreading units; and

a transmitting unit to which output signals of said first and second spreading units are inputted,

wherein a first chaos spreading code which is inputted to said first spreading unit and a second chaos spreading code which is inputted to said second spreading unit orthogonally cross each other, that is, an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3.

2.   A communicating apparatus according to claim 1, wherein a sum of squares of amplitude values of said first and second chaos spreading codes is constant.

3.   A communicating apparatus according to claim 1, wherein

said first and second chaos spreading codes are formed by a chaos spreading code generator comprising: a storing unit in which an initial value is set; a mapping unit for executing mapping once in which a map according to a Chebyshev's polynomial has been applied to the value that is outputted from said storing unit or for divisionally executing said mapping a plurality of number of times;

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randomizing means for randomizing a least significant bit
of an output of said mapping unit; and a path for outputting
the output of said mapping unit including said randomized
least significant bit, as said chaos spreading code, and
5   returning said output to said storing unit, and

said initial value is made different between said
first and second chaos spreading codes.

4.   A code division multiple access communicating
apparatus according to claim 1, wherein a user is identified
10 by said first and second chaos spreading codes.

5.   A communicating apparatus according to claim 1,
wherein

said transmitting unit is a radio transmitting
unit for

15 adding the output signals of said first and second
spreading units,

up-converting an addition output into a
predetermined carrier frequency, and

transmitting an up-converted output from an
20 antenna.

6.   A communicating apparatus according to claim 1,
wherein

said transmitting unit is a radio transmitting
unit for

25 up-converting each of the output signals of said
first and second spreading units into carriers which have
predetermined frequencies and orthogonally cross each other,

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and

        adding up-converted outputs and transmitting an addition output from an antenna.

7.   A communicating method which makes spreading by multiplying transmission data by a chaos spreading code and transmits a spreading output, comprising the steps of:

        spreading the transmission data by first and second chaos spreading codes, respectively, and forming first and second spreading outputs; and

        transmitting said first and second spreading outputs,

        wherein said first chaos spreading code and said second chaos spreading code orthogonally cross each other, that is, an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3.

8.   A method according to claim 7, wherein a sum of squares of amplitude values of said first and second chaos spreading codes is constant.

9.   A method according to claim 7, wherein

        said first and second chaos spreading codes are formed by a chaos spreading code generating method comprising the steps of: setting an initial value into a storing unit; executing mapping once in which a map according to a Chebyshev's polynomial has been applied to the value that is outputted from said storing unit or divisionally executing said mapping a plurality of number of times; randomizing

a least significant bit of a mapping output; and outputting

the mapping output including said randomized least

significant bit, as said chaos spreading code, and returning

said output to said storing unit, and

said initial value is made different between said

first and second chaos spreading codes.

10.   A code division multiple access communicating

method according to claim 7, wherein a user is identified

by said first and second chaos spreading codes.

11.   A communicating method according to claim 7,

further comprising the steps of:

adding said first and second spreading outputs;

up-converting an addition output into a

predetermined carrier frequency; and

transmitting an up-converted output from an

antenna.

12.   A communicating method according to claim 7,

further comprising the steps of:

up-converting each of output signals of said first

and second spreading units into carriers which have

predetermined frequencies and orthogonally cross each

other; and

adding up-converted outputs and transmitting an

addition output from an antenna.

13.   A communicating apparatus for receiving

transmission data constructed by first and second spreading

outputs which have been spread by first and second chaos

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spreading codes, in which said first and second chaos spreading codes orthogonally cross each other, that is, an absolute value of a normalized correlation coefficient of said first and second chaos spreading codes is equal to or less than 0.3, comprising:

a receiving unit for receiving said first and second spreading outputs;

first and second inverse spreading units for inversely spreading said first and second spreading outputs received by said receiving unit by said first and second chaos spreading codes, respectively; and

synchronizing means for synchronizing said first and second chaos spreading codes with a transmitting side.

14. A communicating apparatus according to claim 13, wherein a sum of squares of amplitude values of said first and second chaos spreading codes is constant.

15. A communicating apparatus according to claim 13, wherein

said first and second chaos spreading codes are formed by a chaos spreading code generator comprising: a storing unit in which an initial value is set; a mapping unit for executing mapping once in which a map according to a Chebyshev's polynomial has been applied to the value that is outputted from said storing unit or for divisionally executing said mapping a plurality of number of times; randomizing means for randomizing a least significant bit of an output of said mapping unit; and a path for outputting

the output of said mapping unit including said randomized

least significant bit, as said chaos spreading code, and

returning said output to said storing unit, and

said initial value is made different between said

5   first and second chaos spreading codes.

16.   A code division multiple access communicating

apparatus according to claim 13, wherein a user is identified

by said first and second chaos spreading codes.

17.   A communicating apparatus according to claim 13,

10   wherein said receiving unit has an antenna, down-converts

a reception signal of said antenna, and supplies the

down-converted signal to said first and second inverse

spreading units.

18.   A communicating method of receiving transmission

15   data constructed by first and second spreading outputs which

have been spread by first and second chaos spreading codes,

in which said first and second chaos spreading codes

orthogonally cross each other, that is, an absolute value

of a normalized correlation coefficient of said first and

20   second chaos spreading codes is equal to or less than 0.3,

comprising:

a receiving step of receiving said first and second

spreading outputs;

first and second inverse spreading steps of

25   inversely spreading said first and second spreading outputs

received by said receiving unit by said first and second

chaos spreading codes, respectively; and

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a synchronizing step of synchronizing said first and second chaos spreading codes with a transmitting side.

19.   A method according to claim 18, wherein a sum of squares of amplitude values of said first and second chaos spreading codes is constant.

20.   A method according to claim 18, wherein

said first and second chaos spreading codes are formed by a chaos spreading code generating method comprising the steps of: setting an initial value into a storing unit; executing mapping once in which a map according to a Chebyshev's polynomial has been applied to the value that is outputted from said storing unit or divisionally executing said mapping a plurality of number of times; randomizing a least significant bit of a mapping output; and outputting the mapping output including said randomized least significant bit, as said chaos spreading code, and returning said output to said storing unit, and

said initial value is made different between said first and second chaos spreading codes.

21.   A code division multiple access communicating method according to claim 18, wherein a user is identified by said first and second chaos spreading codes. c

22.   A communicating method according to claim 18, wherein a reception signal of an antenna is down-converted and the down-converted signal is inversely spread.

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